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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/740,705	12/19/2000	Bruce A. Schofield	2204/A77	5025

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EXAMINER	
CURS, NATHAN M	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 05/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/740,705	SCHOFIELD, BRUCE A.	
	Examiner	Art Unit	
	Nathan Curs	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 8, 10, 11, 15, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki et al. (US Published Patent Application No. 2002/0030869) in view of Bogert et al. ("Low crosstalk 4 × 4 TiLiNbO3 optical switch with permanently attached polarization maintaining fiber array"; Bogert et al.; Lightwave Technology, Journal of, Vol 4, Issue 10, Oct 1986, Pages 1542-1545).

Regarding claim 1, Okazaki et al. disclose an optical communication system comprising a first number M of fixed wavelength lasers coupled to a second number N of external modulators (N less than M) through a photonic cross-connect switch, wherein the photonic cross-connect switch is capable of routing the optical carriers of any N of the M fixed wavelength lasers to the N external modulators (fig. 16 and paragraph 0010), and wherein the N external modulators are coupled to N data signals for producing N optical data streams from the N optical carriers and the N data signals. Okazaki et al. does not explicitly disclose maintaining the polarity of the N optical carriers routed to the N external modulators. Bogert et al. disclose an optical switch with polarization fibers used at the inputs and outputs of the switch (fig. 1 and page 1542, col. 1, Abstract and lines 1-11). It would have been obvious to one of ordinary skill in the art at the time of the invention to use polarization maintaining fibers at the input and

output fibers to/from the Okazaki et al. switch, in order to maintain the polarity of the signals leading into and out of the optical switch.

Regarding claim 2, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claim 1, wherein each of the N data signals is fed to one of the N external modulators, but do not disclose that each of the N data signals is fed to a different one of the N external modulators, since in Okazaki et al. N = 1. However, it would have been obvious to one of ordinary skill in the art at the time of the invention, based on the teaching of switch construction disclosed by Bogert al. (fig. 1 and col. 1, lines 1-30), that the switch construction of Bogert et al. could be used to construct the switch of Okazaki et al. to provide the advantage of a low crosstalk switch, or to both modify the system of Okazaki et al. to provide more than one set of output and data modulator and to provide low crosstalk to the Okazaki et al. switch, where the advantage of additional output-modulator sets would be to modulate multiple data streams, each at any of the switch input wavelengths, using only the one set of switch input wavelengths and the one switch.

Regarding claim 3, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claim 1, wherein the outputs of the fixed wavelength lasers comprises optical carriers at distinct wavelengths (Okazaki et al.: fig. 16, elements 21b'-1 and lambdas 1 to 8).

Regarding claim 4, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claim 1, wherein the photonic cross-connect switch comprises: at least M optical inputs coupled to the outputs of the M fixed wavelength lasers; at least N optical outputs coupled to the inputs of the N external modulators; and a photonic cross-connect fabric coupled to the at least M optical inputs and to the at least N optical outputs via polarization

maintaining fiber for routing the optical carriers of any N of the M fixed wavelength lasers to the N external modulators (Okazaki et al.: fig. 16 and paragraph 0010).

Regarding claims 8 and 15, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claims 4 and 10, respectively, wherein the photonic cross-connect fabric comprises a lithium niobate optical switching system (Bogert et al.: col. 1, lines 1-11).

Regarding claim 10, Okazaki et al. disclose a photonic cross-connect device comprising at least M optical inputs coupled to at least N optical outputs (N less than M) through a photonic cross-connect fabric that is coupled to the at least M optical inputs and to the at least N optical outputs and is capable of routing optical signals received over any N of M optical inputs to the N optical outputs (fig. 16 and paragraph 0010). Okazaki et al. does not explicitly disclose maintaining the polarity of the N optical carriers routed to the N external modulators. Bogert et al. disclose an optical switch with polarization fibers used at the inputs and outputs of the switch (fig. 1 and page 1542, col. 1, Abstract and lines 1-11). It would have been obvious to one of ordinary skill in the art at the time of the invention to use polarization maintaining fibers at the input and output fibers to/from the Okazaki et al. switch, in order to maintain the polarity of the signals leading into and out of the optical switch.

Regarding claim 11, Okazaki et al. in view of Bogert et al. disclose the photonic cross-connect device of claim 10, wherein the at least M optical inputs are couplable to at least M fixed wavelength lasers, and wherein the optical signals are optical carriers at distinct wavelengths (Okazaki et al.: fig. 16, paragraph 0010 and elements 21b'-1 and lambdas 1 to 8).

Regarding claim 17, Okazaki et al. disclose a method for producing optical data streams in an optical communication system, the method comprising: maintaining a first number M fixed wavelength lasers, each fixed wavelength laser having an output of a different wavelength that the other fixed wavelength lasers; maintaining a second number N external modulators, wherein

the second number N is less than the first number M; routing optical carriers from each of a predetermined N of the M fixed wavelength lasers to one of the N external modulators; and feeding a data signal to each of the N external modulators to produce N optical data streams at N specific wavelengths (fig. 16 and paragraph 0010). Okazaki et al. does not explicitly disclose maintaining the polarity of the N optical carriers routed to the N external modulators. Bogert et al. disclose an optical switch with polarization fibers used at the inputs and outputs of the switch (fig. 1 and page 1542, col. 1, Abstract and lines 1-11). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Okazaki et al. and Bogert et al. as described above for claim 1. Further, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide more that one output to the Okazaki et al. switch as described above for claim 2.

Regarding claim 18, Okazaki et al. disclose the method of claim 17, wherein routing the output of each of a predetermined N of the M fixed wavelength lasers to a different one of the N external modulators comprises: feeding the outputs of the M fixed wavelength lasers into a photonic cross-connect device that is capable of routing the optical carriers of the any N of the M fixed wavelength lasers to the N external modulators; and configuring the photonic cross-connect device to route the predetermined N of the M fixed wavelength lasers to a different one of the N external modulators (Okazaki et al.: fig. 16 and paragraph 0010 and the combination of Okazaki et al. in view of Bogert et al. as described above for claims 1 and 2).

3. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. as applied to claims 1-4, 8, 10, 11, 15, 17 and 18 above, and further in view of Nagoaka ("Compact latching-type single-mode-fiber switches fabricated

by a fiber-micromachining technique and their practical applications"; Nagaoka, S.; Selected Topics in Quantum Electronics, IEEE Journal of, Vol 5, Issue 1, Jan.-Feb. 1999, Pages 36-45).

Regarding claims 5 and 12, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claims 4 and 10, respectively, but do not disclose that the photonic cross-connect fabric comprises a Micro Electro Mechanical System (MEMS). Nagoaka disclose a MEMS-based MxN polarization-maintaining optical switch design (fig. 11 and abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Nagoaka switch design for the switch of Okazaki et al. to provide the benefit of a compact and cost-effective switch, as taught by Nagoaka.

4. Claims 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. as applied to claims 1-4, 8, 10, 11, 15, 17 and 18 above, and further in view of Nagaoka as applied to claims 5 and 12 above, and further in view of Tuantranout et al. (http://www.nectec.or.th/ntj/No6/papers/No6_tutor_1.pdf).

Regarding claims 6 and 13, Okazaki et al. in view of Bogert et al. and further in view of Nagaoaka diclose the optical communication system of claims 4 and 10, respectively, but do not explicitly described the photonic cross-connect fabric as a Micro Opto Electro Mechanical System (MOEMS). However, Tuantranout et al. disclose that MEMS used for optical applications are commonly referred to as MOEMS (page 228, col. 1, line 30 to col. 2, line 6), so it would have been obvious to one of ordinary skill in the art at the time of the invention that the optical MEMS switch taught by Nagaoka is a MOEMS switch, as optical MEMs and MOEMS are the same.

5. Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. as applied to claims 1-4, 8, 10, 11, 15, 17 and 18 above, and further in view of Makihara et al. ("Micromechanical optical switches based on thermocapillary integrated in waveguide substrate"; Makihara et al.; Lightwave Technology, Journal of, Vol 17, Issue 1, Jan 1999, Pages 14-18).

Regarding claims 7 and 14, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claims 4 and 10, respectively, but do not disclose that the photonic cross-connect fabric comprises a bubble (champagne) optical switching system. Mikihara et al. disclose a bubble optical switching, polarization-maintaining, MxN switch design (fig. 1, abstract, and pages 14-15, Section II and pages 15-16 section IV). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Makihara et al. switch design for the switch of Okazaki et al. to provide the benefit of a small-scale (MEMS sized) and simple-structured switch, as taught by Makihara et al.

6. Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. as applied to claims 1-4, 8, 10, 11, 15, 17 and 18, and further in view of Hakamata et al. ("Method of measuring optical switch crosstalk attenuation considering polarization variation"; Hakamata et al.; Lightwave Technology, Journal of, Vol 12, Issue 8, Aug 1994, Pages 1471-1474).

Regarding claims 9 and 16, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claims 4 and 10, respectively, but do not disclose that the photonic cross-connect fabric comprises a liquid crystal optical switching system. Hakamata et al. disclose an optical LCD, polarization-maintaining, switch design (fig. 7 and pages 1472-1473, Section III.A.). It would have been obvious to one of ordinary skill in the art at the time of the

invention to use a Hakamata et al. switch design for the switch of Okazaki et al. to provide the benefit of an optical switch that can be used for high bit rate signals, as taught by Hakamata et al. Further, it would have been obvious to one of ordinary skill in the art at the time of the invention Further, based on the teaching of switch construction disclosed by Hakamata et al. (fig. 7), it would have been obvious to one of ordinary skill in the art at the time of the invention that the switch construction of Hakamata et al. could be used in the construction of the MxN switch of Okazaki et al. through appropriate cascading of Hakamata et al. switch cells, as is well known in multiple input/output switch construction, and/or not using unnecessary output ports.

Response to Arguments

7. Applicant's arguments filed 7 December 2004 have been fully considered but they are not persuasive.

Regarding the motivation to combine references, the applicant argues that Okazaki et al. would not desire to modify its design to use a polarization maintaining fiber to maintain the polarity of the signals leading into and out of the optical switch for the reasons that polarization fiber is expensive and that all embodiments of Okazaki's optical switch describe an optical to electrical conversion (or vice versa) at an input and an output. Contrary to the applicant's argument, there is no disclosure that the optical switch of Okazaki et al. fig. 16 has electrical conversion at its inputs and outputs. In addition, if it is obvious to combine references for one reason, it is obvious to combine the references for all reasons. Therefore, the cost of polarization fiber would not negate the motivation to combine references because the motivation to combine, as described above for the combination of Okazaki et al. and Bogert et al., is not based on the cost of polarization fiber. Therefore the applicant's arguments against the motivation to combine references are not persuasive.

Regarding claims 1-9, 17 and 18, the applicant argues that Okazaki et al. do not disclose the case where N is less than M and greater than one. With respect to Fig. 16 and paragraph 0010 of Okazaki et al., the examiner agrees that the citation discloses N external modulators where N is less than M and does not disclose that N is greater than 1. However, the applicant does not disclose a limitation of N being greater than one. The applicant discloses an example of four external modulators in applicant's fig. 5, but elsewhere discloses that the number of external modulators is N, where N must only be less than M (e.g. specification page 2, lines 16-27). This is not a disclosure of criticality for N being greater than 1. Absent any disclosure of criticality, the limitation of N being greater than 1 would have been the result of obvious engineering design choice.

Regarding claims 10-16, the applicant argues that Okazaki et al. do not teach a "photonic cross connect fabric". However, Okazaki et al. do teach an 8:1 optical switch in fig. 16 for connecting one of the eight inputs to the output. This disclosure of an 8:1 optical switch is a cross-connect arrangement and reads on the limitation "a photonic cross-connect device comprising at least M optical inputs coupled to at least N optical outputs (N less than M) through an photonic cross connect fabric".

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

9. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

JASON CHAN
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